DOCUMENT RESUME

ED 258 178 CS 208 870

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TITLE Developmental Trends and Interrelationships among Preprimary Children's Knowledge of Writing and Reading Readiness Skills.
PUB DATE [83]
NOTE 24p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences; Auditory Discrimination; Child Development; Handwriting; Kindergarten; *Knowledge Level; *Language Acquisition; Preschool Children; *Reading Readiness; Reading Skills; Visual Perception; *Writing Readiness; *Writing Research; Writing Skills
IDENTIFIERS *Reading Writing Relationship

ABSTRACT

Forty-eight children, equally divided among three-, four-, and five-year-old groups, were subjects in a study that explored the development and interrelationships among several facets of writing knowledge and reading readiness skills. Three categories of tasks were administered: knowledge of functions, knowledge of forms, and reading readiness skills. The knowledge of functions tasks assessed children's understanding of writing's everyday uses, including writing a list, a letter, and a label. The writing forms tasks assessed dependence on unit features and/or recognition rules, use of production rules, and paper and pencil name writing skills. Reading readiness tasks assessed auditory discrimination, visual discrimination, and letter naming skills. Results indicated that performance scores increased across age groups on all tasks. However, the greatest differences in scores were between the three- and four-year-old groups. Children exhibited the greatest understanding of the practical applications of labeling. Older children appeared more interested in the presence of English letter features than the display's adherence to recognition rules in sorting writing and pseudowriting task cards. All five-year-old children were able to write their first names with a pencil on paper. Significant interrelationships among reading and writing knowledge varied among the groups. (Author/HOD)

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Developmental Trends and Interrelationships Among Preprimary Children's Knowledge of Writing and Reading Readiness Skills

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Abstract

The purpose of this study was to explore the development and interrelationships among several facets of writing knowledge and reading readiness skills. The subjects were 48 children equally divided among three, four, and five-year-old groups.

Three categories of tasks were administered: knowledge of functions, knowledge of forms, and reading readiness skills. The knowledge of functions tasks assessed children's understanding of writing's everyday uses, including writing a list, letter, and label. The writing forms tasks assessed three areas: dependence on unit features and/or recognition rules, including linearity, spacing, multiplicity, and directionality of letter units; use of production rules, such as directionality, linearity, spacing, and orthography, in writing with magnetic letters; and "paper and pencil" name writing skills. Reading readiness tasks assessed auditory discrimination, visual discrimination, and letter naming skills.

Performance scores increased across age groups on all tasks. However, the greatest differences in scores were between the three and four-year-old groups. Children exhibited the greatest understanding of the practical applications of labeling. Older children appeared more interested in the presence of English letter features than the display's adherence to recognition rules in sorting writing and pseudowriting task cards. In word production, the greatest success was found in the use of spacing, linearity, directionality, and orthography production rules, respectively. All five-year-old children were able to write their first names with a pencil and paper. Significant interrelationships among reading and writing knowledge varied among the groups.

Developmental Trends and Interrelationships Among Preprimary Children's Knowledge of Writing and Reading Readiness Skills

Young children possess some knowledge of the print world including the purposes and processes of print prior to entering first grade (Goodman & Goodman, 1976; Hiebert, 1979; Watson & Wiseman, 1980). These beginnings of literacy are rooted in their first-hand experiences with a contextually based print environment. Children's natural learning curiosity is further stimulated through vicarious experiences with the printed communications of parents, older siblings, teachers, and caregivers.

Case studies (Baghban, 1979; Bissex, 1980; Burke & Harste, 1980; Clay, 1975; Deford, 1980; Dyson, 1983) have generated invaluable information and hypotheses about the development of children's writing knowledge. The information gleaned from these records provides support for additional studies of the developing knowledge of functions and forms of writing across groups of three, four, and five-year-old children. Furthermore, while writing and reading are interrelated processes (Clay, 1975; Deford, 1981; Durkin, 1978; Goodman & Goodman, 1983), investigations of these interrelationships have been limited, especially in the beginning stages of literacy.

The purpose of the study was to explore the development and interrelationships among several facets of writing knowledge and reading readiness skills in a cross-section of three, four, and five-year-old children. In doing so, it was necessary to select the types of information

which would serve as the best indicators of reading and writing knowledge. Three categories of writing knowledge and related tasks were chosen: writing functions, writing forms, and reading readiness skills.

The first category, knowledge of functions, dealt with young children's understanding of the inherent purpose of print to communicate thoughts, ideas and information. This awareness has been demonstrated in the meaning conveyed through children's simple graphic productions (Bissex, 1980; Clay, 1975; Ferreiro & Teberosky, 1979). To assess the extent of knowledge of function, tasks were developed which were representative of everyday writing experiences such as writing a letter, list, or label.

Knowledge of writing forms was assessed by the second category of tasks. Knowledge of forms is indicated by children's awareness of the visual aspects of print (Lavine, 1977) and their abilities to produce writing forms which closely approximate conventional English writing (Burke & Harste, 1980; Deford, 1980; Ferreiro & Teberosky, 1979). Three tasks were included in the writing forms category, The first assessed children's abilities to visually discriminate writing from pseudowriting using the characteristics of the displays. The remaining two tasks dealt with their writing production capabilities including the use of specific "production rules" in writing with magnetic letters and name writing skills using a paper and pencil.

The final category of tasks included measures which would examine reading readiness skills. Attempts to assess these skills typically involve tests of letter naming and auditory and visual discrimination abilities (Downing & Thackray, 1979; Pflaum, 1974). Some children are capable of passing letter naming tasks prior to entering first grade (Mason, 1980;

Smythe, Stennett, Hardy, & Wilson, 1971). There is also evidence that young children possess some auditory and visual discrimination capabilities necessary for beginning reading and writing (Chapman, 1971; Gibson, Gibson, Pick, & Osser, 1962). Consequently, auditory discrimination, visual discrimination, and letter naming tasks were incorporated in the reading readiness category.

The major research questions are as follows:

1. What are the differences among three, four, and five-year-old children's knowledge of functions and forms of writing and their reading readiness skills?

2. What are the interrelationships among three, four, and five-year-old children's knowledge of the functions and forms of writing and their reading readiness skills?

Method

Subjects

Forty-eight subjects were selected from day care, nursery, and kindergarten programs in two central Kentucky cities. They were equally divided among three age groups: 36 to 45 months, 48 to 57 months, and 60 to 69 months. There was an equal number of boys and girls in each age group. Families of the children were described by the program directors as middle income.

Materials and Procedures

The tasks were presented to individual children in their respective program sites. Due to the short attention span of many young children and

efforts to avoid a response set, the tasks were divided into two, twenty-minute sessions spaced from seven to 10 days apart.

Functions of writing tasks. Three communication experiences common to the home and/or school environment: writing a list, label, and letter, were selected as indicators of children's understanding of the functional purposes and processes of writing. Because some young children do not have the fine motor capabilities to perform these functions, Hiebert's (1979) vignette methods were incorporated in the tasks. In three separate story vignettes, child-like characters, Max and Maggie, must make decisions to solve communication dilemnas. In the listing vignette, "Maggie's Birthday Party", Max plans a surprise birthday party for Maggie. The children must decide how Max can possibly remember all the items he must buy at the store for the party. The labeling vignette, "The First Day of School", finds Max and Maggie faced with identifying their lockers from several lockers containing similar red sweaters. The children are asked to help Max and Maggie solve their problem. The letter writing vignette, "Max Takes a Trip", describes Max's trip to visit his grandmother. Max becomes lonely for Maggie and attempts to think of ways to communicate with her. The situation is complicated by his grandmother's lack of a telephone. Again, the children are asked to help Max reach an appropriate solution. Throughout the story, the verbal and picture prompts became increasingly concrete. Scoring was based on the level (0-5) of prompt required to elicit an appropriate response. For example, a score of "5" was awarded to children able to solve the situation without a prompt. Conversely, a score of "0" was assigned if the children were unable to complete the task after being

read the entire story vignette.

Writing forms tasks. The purpose of the visual recognition task was to determine children's dependence on features and/or recognition rules in discerning writing displays. Features include the lines and curves which are characteristic of each letter of the English alphabet. Rules assessed were: linearity of units, that is, the presence of letters on a horizontal plane; variety of units, that is, the use of different letters units within a word; multiplicity of units, that is, the use of more than one unit within a word; and the use of appropriate spacing between the letter units of a word. The task materials consisted of 32 task cards containing graphic displays. The cards were equally divided between writing and pseudowriting displays in order to assess children's use of features. To determine their use of rules, both sets of cards, i.e., writing and pseudowriting, were equally divided by rule adherence and rule non-adherence. Four cards in each set were representative of each rule. For example, two cards contained English writing forms (words) which adhered to the linearity rule while two cards contained writing forms which did not adhere to the linearity rule. Similarly, two cards contained pseudowriting forms which adhered to the linearity rule and two cards contained pseudowriting forms which did not adhere to the linearity rule.

The card displays met several criteria. As children appear to recognize uppercase letters more easily (Mason, 1980; Popp, 1964), only uppercase letters were used. To provide words and letters which had the greater possibility of being in preprimary children's experience, lists of high imagery words (van der Veur, 1975) and high frequency words and letters (Zettersten, 1969) were employed. This procedure yielded the following task words: BRIDGE,

COWBOY, DOCTOR, FINGER, MONKEY, STRING, TURKEY, and WINDOW.

Letters from the English tasks words were alphabetized and matched with pseudowriting units (Gibson, Gibson, Pick, & Osser, 1962). The pseudowriting units were organized in the same order as the letters of each English task word, e.g., BRIDGE and ⅁ꓤꓶꓤ⅁.

The children were asked to assist the interviewer in selecting those cards containing writing which the interviewer could read. Messages were placed, by the children, in a cardboard "mailbox".

Separate scoring systems were used. To ascertain a score reflecting children's use of features, comparisons were made between responses to cards with writing and pseudowriting displays adhering to all recognition rules. To determine the children use of rules in distinguishing writing from pseudowriting, comparisons were made in responses between cards containing writing forms adhering to all rules and those containing writing forms not adhering to rules and between pseudowriting cards adhering to rules and pseudowriting cards not adhering to rules.

Production of writing forms was assessed with magnetic letters and paper and pencil. The magnetic letter task was used to assess children's use of production rules including directional placement of letter units in a left-to-right fashion, linear placement of letters on a horizontal plane, correct spacing between letter units, and orthography, i.e., the correct spelling of words. Task materials included white magnetic letters and a black magnetic board. The individual task words were also displayed on 3" x 5" cards. Several criteria were established prior to selecting the task words. Each word consisted of three uppercase letters. To provide words and letters

within the children's experience, lists of high frequency letters (Zettersten, 1969) and high imagery words (van der Veur, 1979) were utilized. The selection procedure yielded the following task words: HAT, BED, and MAN. To accurately assess the children's spelling abilities, two additional letters were joined with the letters of the task words. The order of magnetic letter presentation was: HOAST, EDBTA, and NRMDA.

The task word was first presented without the task word models. The children were simply asked to write the task word. During the second administration of the task, the task word model was present above the magnetic board. The combinations of magnetic letters which the children produced were assessed for the degree of adherence to each production rule. Four levels (0-3) of performance were possible.

The name writing task required the children to write their names with paper and pencil. The task was scored based on the level (0-3) of sophistication of the writing production, e.g., no response, drawings, selected letters, and first name.

Reading readiness tasks. The auditory and visual discrimination tasks were selected from those adapted by Hiebert (1979) from the Wisconsin Pre-reading Skills Inventory (Venezky, Pittleman, Kamm, & Leslie, 1975) The sound matching task materials consisted of nine task cards. At the top of each card was an uppercase letter. Pictures of three objects were below the letter. One object's name began with the sound of the letter. Another object's name ended with the sound of the letter. The third object did not contain the letter sound. The children were instructed to locate the object whose name began with the sound of the letter. All correct choices were

scored as "1" with the maximum possible score "9".

The visual discrimination task materials consisted of 12 task cards containing a stimulus letter or word, an identical letter or word, and two alternatives which were similar to the stimuli. Cards addressed letter order, letter orientation, and word detail. The interviewer asked the children to point to the letter(s) or word which looked the same as the stimulus. Correct responses were scored as "1" yielding a maximum score of "12".

Twenty-six task cards, each containing an uppercase letter of the alphabet, comprised the letter naming task materials. The children were asked to name the letter on each card as presented in random order. As suggested by Hiebert (1979), the task was discontinued if the children produced six consecutive incorrect responses and a score of "0" was assigned. The maximum score was "26".

Results

Descriptive summaries, utilizing SAS (1982) univariate procedures were employed to determine the differences among the group's writing knowledge and reading readiness skills. Possible interrelationships among the functions and forms of writing and reading readiness skills were examined through Pearson product-moment correlation coefficients. The results indicated that some children in all age groups possessed some knowledge of writing's functions and forms as well as reading readiness skills. As expected, knowledge in all categories increased across age groups. However, the greatest gains were noted between the three and four-year-old groups. Major findings of the study are reported by task category.

Functions of Writing Task Results

While the mean scores on the listing (threes, 1.00; fours, 2.25; fives, 3.75); labeling (threes, 2.76; fours, 3.88; fives, 4.81); and letter writing (threes, 1.06; fours, 3.31; fives, 4.25) tasks increased across age groups, children experienced the greatest success in solving the labeling task situation in all age groups. Conversely, they had the greatest difficulty with listing in all age groups.

Forms of Writing Task Results

Visual recognition of writing forms. Children's dependence on features and/or rules to sort writing cards from pseudowriting cards was explored through separate analysis for: use of features, use of recognition rules, and relative dependence on features versus rules. In the analysis for use of features, the mean scores across groups (threes, 9.25; fours, 10.94; fives, 12.00) revealed that children's demands for graphic units to adhere to features of English letter units increased across age groups. Mean scores, computed by rule, indicated that children's awareness of the importance of rule adherence also increased across age groups. Furthermore, the multiplicity and variety of units rules were considered the most significant recognition rules by children from all age groups, i.e., displays had to contain multiple and different letter units.

To establish whether children rely more on the features or the rules named to discern English writing forms, responses to the task cards were subjected to a 3 (age group) x 2 (rules) x 2 (features) repeated measures analysis of variance (Brown, 1977). Age was the between-subject factor while rules and features were the within-subject factors. The dependent variable

was the number of correct responses to the task cards. Only "yes" responses to the writing cards which adhered to all recognition rules were correct in this analysis.

Significant main effect were found for Group, F (2,45) = 6.04, $p < .005$; and Rules, F (2,45) = 3.09, $p < .005$. However, the main effect for rules must be considered in terms of the significant two-way interaction between Rules and Features, F (1,45) = 14.75, $p < .005$. In addition, the interaction between Group and Features approached significance F (2,45) = 3.09, $p < .06$.

Follow-up tests (Scheffé; $p < .05$) for the Group main effect indicated that the three's performance ($\bar{X}$ = 3.60, S.D. = 1.86) differed from that of fours ($\bar{X}$ = 5.13, S.D, = 1.85) and fives ($\bar{X}$ = 5.61, D.D. = 2.07). The performance of fours and fives did not differ significantly from one another.

Tests of simple main effects($p < .05$) were use to examine the significant Rules X Features situation. These analyses indicated that when the task card contained writing adhering to rules, scores ($\bar{X}$ = 6.31, S.D. = 2.90) were higher than when the writing task cards did not adhere to rules ($\bar{X}$ = 3.45, S.D. = 2.94). Scores on task cards containing pseudowriting adhering to rules ($\bar{X}$ = 4.42, S.D. = 3.57) did not differ from scores on pseudowriting task cards not adhering to rules ($\bar{X}$ = 4.58, S.D. = 3.45). Tests of simple effects also revealed that when the task cards adhered to the rules, the mean for writing ($\bar{X}$ = 6.31, S.D. = 2.90) was significantly higher than the mean for pseudowriting ($\bar{X}$ = 4.42, S.D. = 3.57). In contrast, when the task cards did not adhere to rules, the mean for writing ($\bar{X}$ = 3.48, S.D. = 2.94) was

significantly lower than the mean for pseudowriting ($\bar{X}$ = 4.58, S.D. = 3.45).

A graph of cell means (Figure 1) further describes the interaction between children's use of features and rules at each age group. The means indicate that younger children give attention to the entire display, including the rules and features. Older children give attention to the entire display, but are more interested in the conformity of the unit features to English writing forms than strict adherence of the display to recognition rules.

Insert Figure 1 about here

Production of writing forms tasks. The results of the task assessing children's use of production rules in writing with magnetic letters revealed the presence of rule knowledge in all age groups (Table 1). The order of difficulty in using the production rules was similar in all groups. The children had the least difficulty using appropriate spacing between the magnetic letters within the word. They also had little difficulty in placing the letters in a linear fashion. The children had the most difficulty with the orthography and directionality rules, respectively. However, their ability to use directionality and orthography rules increased when the task word model was present.

Insert Table 1 about here

In the paper and pencil name writing task, writing skills improved across age groups. While one-half of the three-year-old children drew

pictures to represent their names, such drawings were not present at the four and five-year-old levels. In fact, 69% of the four-year-olds and 100% of the five-year-olds were able to write at least their first names. However, only four (12.5%) and five-year-old (37.%) girls spontaneously wrote their first and last names.

Reading Readiness Task Results

As in the two previous task categories, the children's skills on the reading readiness tasks increased across age groups. However, the results revealed sizeable standard deviations suggesting a great deal of variability in the performances of children within age groups. One example is the auditory discrimination task results which are presented by successive age groups: $\bar{X}$ = 2.75, S.D. = 2.41; $\bar{X}$ = 4.88, S.D. = 2.03; $\bar{X}$ = 6.69, S.D. = 2.15. Standard deviations were also large on the visual discrimination task. By successive age group, the scores were: $\bar{X}$ = 2.38, S.D. = 2.39; $\bar{X}$ = 6.00, S.D. = 2.34; $\bar{X}$ = 7.44, S.D. = 2.61.

The largest standard deviations were found in the results of the letter naming task. The scores from ages three through five were: $\bar{X}$ = 8.06, S.D. = 10.18; $\bar{X}$ = 16.06, S.D. = 10.04; $\bar{X}$ = 21.94, S.D. = 6.98, respectively.

Interrelationships

To determine possible interrelationships among facets of writing knowledge and reading readiness, task scores were compiled. Correlation coefficients did not reveal patterns in the interrelationships across age groups. This finding is tempered by several possible limitations of the study: on a number of tasks, the high scores of the five-year-old children created "ceiling effects"; similarly, low scores of the three-year-olds

created "floor effects"; and the sizeable differences in the ranges of scores among categories may have distorted the correlation coefficients. The correlation coefficients are presented by category in Table 2.

Insert Table 2 about here

Discussion

The results support case study observations that young children develop print knowledge prior to formal training. The results further suggest patterns in the development of beginning literacy skills and indicate heightened awareness of writing knowledge and reading readiness skills between ages three and four.

Trends were noted in the children's awareness of the purposes of writing in that the use of labeling was achieved prior to the understanding of letter writing and listing. This supports earlier theories (Clay, 1975; Ferreiro & Teberosky, 1979; Goodman & Goodman, 1983) that, in order to understand the functions of writing, children must first possess a conceptual awareness that writing serves to label or represent an object.

Children also exhibit a variety of levels in building theories about the visual aspects of print. Their desire for print to contain multiple and various units is not surprising considering very little meaningful environmental print contains a single letter or the same letters. It is also not surprising that their concern for the features of the individual units becomes more important than their consideration for the characteristics of

the global display as acquisition of literacy knowledge generally moves from global to specific knowledge about print. This finding is supportive of the earlier studies of Lavine (1977).

The children's knowledge of word production rules was evident in their manipulation of magnetic letters. The order of rule attainment from least to most difficult was: spacing, linearity, directionality, and orthography. This finding lends support to observations (Deford, 1980) that children are concerned about the mechanics of writing production. Furthermore, the increased orthography scores which were made with the presentation of a task word model provide additional support for the presence of letter and word matching capabilities among young children.

While the trends in name writing were similar to those of Hildreth's (1936), children in this study, conducted almost 50 years later, gave evidence of more advanced name writing skills. It is likely that the increase in the presence of environmental print fosters the earlier acquisition of children's print knowledge.

The findings of the study support those of earlier studies (Chapman, 1971; Hiebert, 1979; Mason, 1980; Popp, 1964; Wheelock, 1968) indicating still limited but increasing reading readiness skills across age groups. Of particular interest was the high level of proficiency in letter naming indicated by the scores of the five-year-old children.

Goodman and Goodman (1983) noted that the relationship between reading and writing " ... is not simple or isomorphic" (p. 591). Attempts to determine relationships among the reading and writing tasks in this study

added support to their observation as no systematic patterns of interrelationships were revealed. However, the failure of this analysis to yield evidence of significant relationships should not be interpreted as an indication these aspects of beginning literacy are not related, but that more research is needed to understand the nature of these relationships.

This study provides a number of contributions to the growing field of literacy research. It is one of the few studies which have explored many facets of beginning literacy concurrently. Furthermore, it is one of the few studies to attempt to explore the relationships among various aspects of literacy across successive age groups of children. Perhaps the most unique contribution of the study was the development of an instrument for collecting information relative to groups of three, four, and five-year-old children's knowledge of the communicative functions of writing. The story vignettes serve as an alternative to requesting written communicative messages from very young children with limited fine motor capabilites. Also unique to this study was the assessment of young children's conceptual understanding of production rules using magnetic letters to offset limited fine motor skills.

As inferred from the findings of this study, teachers of young children should recognize the extent of print knowledge which young children bring to the program. It is likely such knowledge may be fostered through a variety of meaningful print experiences. Examples include creating and receiving simple messages, experimenting with print production using various media, and using whole words containing multiple and various letters rather than rote exercises with isolated letter units.

Suggestions for further research may also be derived from this study. Most importantly, tasks which tap children's conceptual knowledge of reading and writing processes should be developed in keeping with young children's needs for concrete experiences. Further studies should explore the nature of the greater differences in print knowledge indicated between the three and four-year-old groups. Finally, additional methods are needed to determine the relationships among the various aspects of developing literacy.

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Table 1

Use of Production Rules in Writing With Magnetic Letters

Mean Scores (and Standard Deviations) by Age Group

Writing Rule	Age Group		
	Threes	Fours	Fives
Directionality			
Without a Model	1.81 (.78)	2.35 (.98)	2.75 (.58)
With a Model	1.88 (1.00)	2.46 (.56)	2.94 (.18)
Linearity			
Without a Model	2.81 (.38)	2.75 (.77)	2.98 (.08)
With a Model	2.67 (.68)	2.96 (.11)	3.00 (-0-)
Spacing			
Without a Model	2.96 (.17)	2.79 (.75)	3.00 (-0-)
With a Model	2.70 (.72)	2.84 (.25)	2.88 (.34)
Orthography			
Without a Model	.08 (.19)	.10 (.29)	.31 (.55)
With a Model	.71 (1.06)	2.40 (1.01)	1.92 (1.39)

Note. The maximum score was 3.
[a]n = 16.

Table 2

Intercorrelations Among the Writing Functions, Writing Forms, and Reading Readiness Categories

		Functions	Forms		Readiness
Age/Categories	n		Visual Recog.	Pro-duction	
Threes	16				
Functions		-	.21	.64*	.52*
Forms					
Visual Recog.			-	.35	.46
Production				-	.83**
Readiness					-
Fours	16				
Functions		-	.59*	.44	.37
Forms					
Visual Recog.			-	.61*	.18
Production				-	.48
Readiness					-
Fives	16				
Functions		-	.13	.32	.61*
Forms					
Visual Recog.			-	-.10	-.02
Production				-	.34
Readiness					-

*$p < .05$. **$p < .005$.

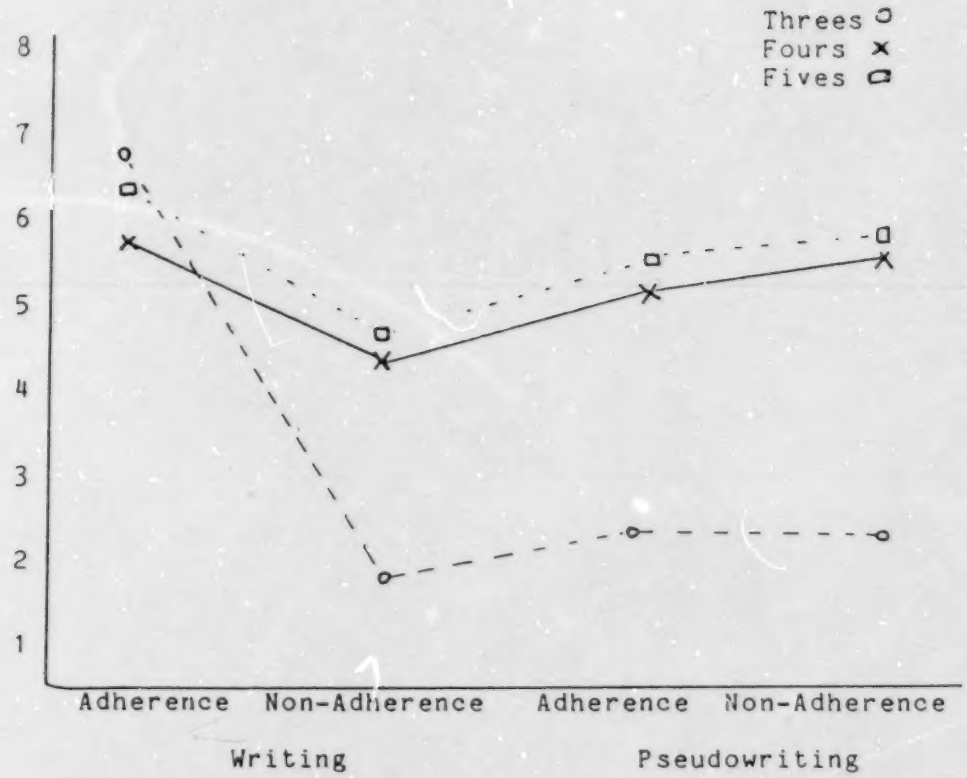

Figure 1: Cell means for children's use of features and rules.